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On the status and position of *Melitaea minerva* var. *palamedes* Groum-Grshimaïlo, 1890 (Lepidoptera: Nymphalidae)

S. K. Korb, Z. F. Fric & A. Bartonova

Abstract

Melitaea palamedes Groum-Grshimaïlo, 1890 is treated here as a subspecies of *M. minerva* Staudinger, 1881, based on molecular data and morphology: *Melitaea minerva palamedes* Groum-Grshimaïlo, 1890, stat. rev.

KEY WORDS: Lepidoptera, Nymphalidae, *Melitaea palamedes*, *Melitaea minerva*, status, position, COI-sequence.

Sobre el estatus y posición de *Melitaea minerva* var. *palamedes* Groum-Grshimaïlo, 1890 (Lepidoptera: Nymphalidae)

Resumen

Melitaea palamedes Groum-Grshimaïlo, 1890 es tratada aquí como una subespecie de *M. minerva* Staudinger, 1881, basado sobre datos moleculares y morfología: *Melitaea minerva palamedes* Groum-Grshimaïlo, 1890, est. rev.

PALABRAS CLAVE: Lepidoptera, Nymphalidae, *Melitaea palamedes*, *Melitaea minerva*, estatus, posición, COI-secuencia.

Introduction

HIGGINS (1941) in his revision of the butterfly genus *Melitaea* treated *M. minerva* var. *palamedes* Groum-Grshimaïlo, 1890 as a synonym of *M. minerva minerva* Staudinger, 1881; TSHIKOLOVETS (2003, 2005) treated as valid a subspecies of *M. minerva*. However, in the last revision of the complex of *Melitaea minerva* by KOLESNICHENKO & CHURKIN (2003), they shifted the taxon *palamedes* as a member of the species group of *M. sultanensis* Staudinger, 1886. Furthermore, KOLESNICHENKO & CHURKIN (2003) designated the lectotype of *M. palamedes* (in Zoological Institute, St.-Petersburg, Russia). Finally, after some years CHURKIN & KOLESNICHENKO (2006) elevated this taxon to full-species rank, accompanied with a description of a new subspecies (*M. palamedes alabel* Churkin & Kolesnichenko, 2006). The closely related species within this group (*M. minerva*, *M. pallas* Staudinger, 1881 and *M. palamedes*) inhabit high-mountainous meadows (at elevations over 2200 m); all these taxa and also their subspecies - whose number is far too high require careful revision, so we list here only species-group taxa without connection to the species names: nominotypical ones, *pseudotersa* Kolesnichenko & Churkin, 2000, *repens* Kolesnichenko & Churkin, 2000, *tersa* Kolesnichenko & Churkin, 2000, *acerba* Kolesnichenko & Churkin, 2000, *iracunda* Kolesnichenko & Churkin, 2000, *mendax* Kolesnichenko & Churkin, 2000, *interpres* Kolesnichenko & Churkin, 2000, *vaschenkoi*

Kolesnichenko & Churkin, 2000, *pseudoalpina* Kolesnichenko & Churkin, 2000, *koitezek* Kolesnichenko & Churkin, 2000, *alabel*). As was shown recently, the wing pattern within the closely related *Melitaea*-species cannot be used for reliable species identification (JUGOVIC & KOREN, 2014); the genitalia features also are very variable (BUSH, 2011). If we will look at the type specimens of *M. minerva*, *M. pallas* and *M. palamedes* (figs. 1, 2, 4, 5, 7, 8) and at their male genitalia (figs. 9-11), although their external features are quite different, the male genitalia in all three are similar (if not identical).

Materials and methods

Abbreviations used:

SKK - collection of Stanislav K. Korb, Nizhny Novgorod, Russia

GDM - Darwin Museum, Moscow, Russia

ZISP - Zoological Institute, St.-Petersburg, Russia

ZMHU - Museum für Naturkunde, Berlin, Germany

We studied the following specimens of the *M. palamedes*-phenotype (one of them was sequenced), and found that their external morphological features are mixed up between the *M. sultanensis* and *M. minerva* - groups:

Kazakhstan: 2 ♂♂, 23-VI-2007, Transilian Alatau Mts., Bolshoe Almaatinskoe ozero Lake, 2400 m, leg. P. Egorov (SKK); 1 ♀, 27-VI-2010, Transilian Alatau Mts., Chimbulak, 2200 m, leg. S. K. Korb (SKK). Kyrgyzstan: 1 ♀ (sequenced), 31-VII-2014, Kirghizsky Mts., Ala-Archa Nature Reserve, 2420 m, leg. S. K. Korb (SKK); 1 ♂, 1 ♀, 8-VI-2005, southern slope of Talassky Alatau Mts., Suusamyr river valley, 45 km E of Alabel pass, 2300-2400 m, leg. S. Churkin (holotype and paratype of *M. palamedes alabel* Churkin & Kolesnichenko, 2006) (GDM); 3 ♂♂, 2 ♀♀, Gulcha, leg. G. Grumm-Grshimailo (lectotype and paralectotypes of *M. minerva* var. *palamedes*) (ZISP).

Additional type material studied: *M. minerva* Staudinger, 1881, 3 ♂♂, 2 ♀♀, Ala Tau (lectotype, paralectotypes) (ZMHU). VAN OORSCHOT & COUTSIS (2014) erroneously stated that the lectotype of *M. minerva* was designated by ACHTELK (1999), but in fact there is present only the lectotype designation of *M. sultanensis* in the cited paper; the same applies also for *pallas*); *M. pallas* Staudinger, 1886, 6 ♂♂, 7 ♀♀, Namangan, Margelan (lectotype, paralectotypes) (ZMHU); *M. minerva palamedes* (Groum-Grshimailo, 1890), 2 ♂♂, 1 ♀, Gulcha (lectotype, paralectotypes) (ZMHU, ZISP). Additional material on *M. minerva* and *M. pallas* studied: over 200 specimens of every species from different locations in Kazakhstan and Kyrgyzstan.

DNA was extracted using the Geneaid Genomic DNA Mini Kit, Tissue. 5P fragment of the Cytochrome C oxidase subunit I ("barcode region") was amplified using primers HybLCO and HybHCO according to protocols by WAHLBERG & WHEAT (2008). PCR products were sequenced by Macrogen Inc. (Seoul, Korea). The sequences were aligned in BioEdit ver. 7.0.9.0. For the tree calculations, we used Maximum Likelihood with transition and transversion substitutions included, and with Gamma distributed heterogeneous rates in MEGA 6.

Comparative material was used from GenBank (see fig. 1 for Accession Numbers).

Results and conclusion

We have the following results of our study. First of all, the genitalia features within this species complex are not sufficient for species determination; using genitalia it is impossible to determine *M. palamedes*-phenotypes too. Similarly wing pattern is very variable within the whole genus *Melitaea*. So, the status and position of this phenotype depend on the point of view of a researcher. Unfortunately the majority of taxonomic work lacks any analytical tools and the taxa are

placed within any of the listed species, or can be erected to full-species rank. In this situation only molecular methods can resolve the problem.

On the phylogenetic tree of the closely related taxa of *M. minerva* and *M. sultanensis*- groups (fig. 12) we can see that our sample is placed within *M. minerva* samples and thus it belongs to this species. If *palamedes* is a hybrid between *minerva* and *sultanensis* or *pallas*, we would be unable to see it from the mitochondrial marker; we would need to try also a nuclear marker, but unfortunately the nuclear markers are usually too slow to be good for the specific or infraspecific level. Most likely it is a subspecies of *M. minerva*, which, according to its type locality (Gulcha in Alai Mts., Kyrgyzstan), should be distributed in Alai and Inner Tian-Shan. All other subspecies described for *M. minerva* and *M. palamedes* in the last two decades must be carefully revised because [sic] “Kolesnichenko & Churkin have established numerous taxa of species and subspecies rank. Unfortunately, most of these taxa do not represent geographical variation (the authors likely pursued commercial interest). Even the specimens from the type series represent an absolute transition of one taxon into another in both morphological characters and genitalia armatures. The genitalia drawings are crudely made and do not provide identification. The authors did not examine the type material of the previously described taxa, they used very limited comparative material” (TSHIKOLOVETS, 2005: 344).

So, according to our data the correct identification should be: *Melitaea minerva palamedes* Groom-Grshimaïlo, 1890, **stat. rev.**

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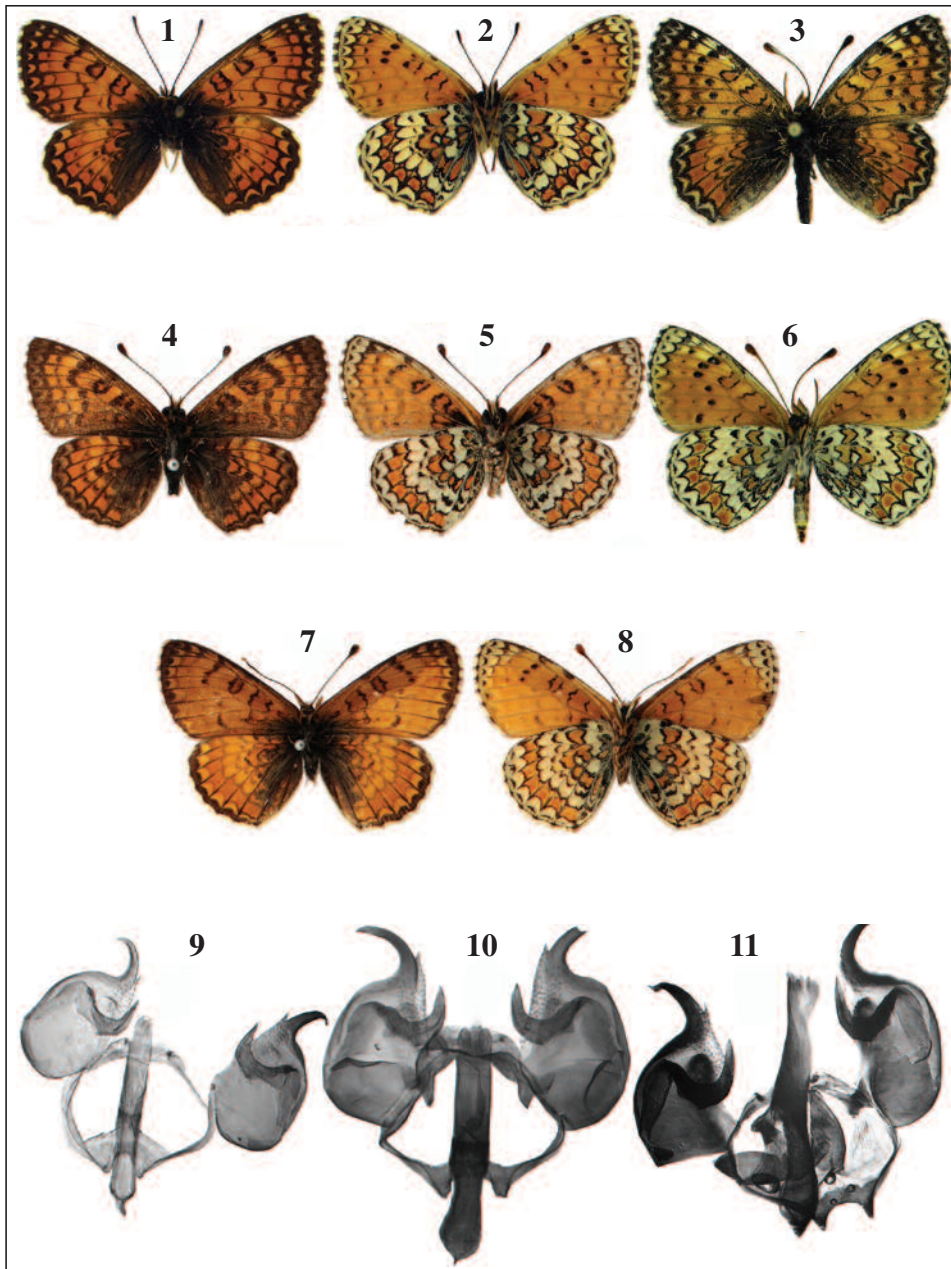
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Figs. 1-12.— *Melitaea*. 1-8. Imagos, 9-11. Genitalia. 1-2. *M. minerva palamedes*, lectotype. 3, 6. *M. minerva palamedes*, sequenced specimen. 4-5. *M. minerva*, lectotype. 7-8. *M. pallas*, lectotype. 9. *M. minerva*, lectotype. 10. *M. pallas*, lectotype. 11. *M. minerva palamedes*, paralectotype.

